

Momentum

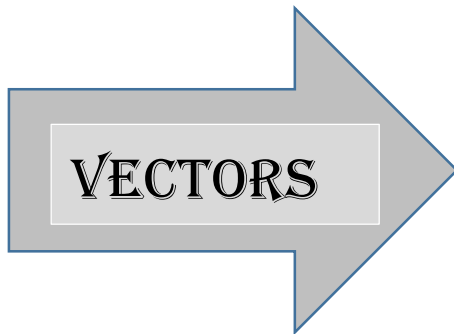
Sir Isaac Newton wrote about the 'quantity of motion' and stated it was the product of mass and velocity. We now call this momentum.

We know → Heavier, more massive objects, are harder to stop than lighter, less massive, ones.

→ An object going fast is harder to stop than that same object going slower.

So logically...

$$\vec{p} = m\vec{v}$$



Whereas

p = momentum (kg·m/s)

m = mass (kg)

v = velocity (m/s)

Note: p and v are vectors so direction matters. The direction of velocity is the direction of momentum

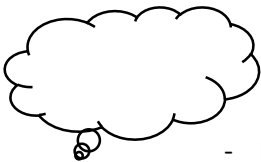
Videos

What is Momentum? → This is a conceptual presentation

https://www.youtube.com/watch?v=i_dKAjx9DZM

Momentum by 'Hewitt Drew It' → This is a more mathematical presentation

<https://www.youtube.com/watch?v=2FwhjUuzUDg>



Thought experiment: What happens when 2 cars of different sizes (and MASS) collide?

- Newton's 3rd → states equal and opposite forces
 - The crash happens only once so the time is the same.
 - But the mass is different.....
- Hmm.....let's discuss....

What causes damage? → Large forces cause damage and these often result from large accelerations!

($F_{net} = ma$). If the object's mass stays the same, then the larger the acceleration, the larger the force! $a \propto F$ We say **a** and **F** are directly proportional. One increases/decreases as the other does.

Or in the case of the car crash, the force is the same, but the masses are not. $a \propto 1/m$

We say **a** and **m** are inversely proportional. As one increases/decreases, the other does the opposite.